SEQUENCE LISTING

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<110> Langermann, Solomon
      Revel, Andrew
      Auguste, Christine
      Burlein, Jeanne

<120>  FimH Adhesin Proteins and Methods of Use

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<150>  US/60/216,750
<151>  2000-07-07

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caaatctttt gccataacga ttacccggaa accattacag actatgtcac actgcaacga 180
ggttcggctt atggcggcgt gttatctcat ttttccggga ccgtaaaata tagtggcagt 240
agctatccat ttcctaccac cagcgaaacg ccgcgcgttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg cctgtgagca gtgcgggtgg ggtggcgatt 360
aaggctggct cattaatggc tgtgctaatt ttgcgacaga ccaataacta taacagcgat 420
gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtggtgcc cactggcggc 480
tgtgatgttt ctgctcgtga tgtcaccgtt actctgccag actaccctgg ttcagtgccg 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct ctccggcaca 600
accgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc tgcacagggc 660
gtcggcgtac agttaacgcg caacggtacg attaatccag cgaataacac ggtatcgtta 720
ggagcagtag ggacttcggc ggtaagtctg ggattaacgg caaattacgc acgtaccgga 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 17
<211> 837
<212> DNA
<213> E. coli

<400> 17
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caaatctttt gccataacga ttatccggaa accattacag actatgtcac actgcaacga 180
ggctcggctt atggcggcgt gttatctaat ttttccggga ccgtaaaata tagtggcagt 240
agctatccat ttcctaccac cagcgaaacg ccgcgcgttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg cctgtgagca gtgcgggcgg ggtggcgatt 360
aaagctggct cattaattgc cgtgcttatt ttgcgacaga ccaacaacta taacagcgat 420
gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtggtgcc tactggcggc 480
tgcgatgttt ctgctcgtga tgtcaccgtt actctgccgg actaccgtgg ttcagtgcca 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct ctccggcaca 600
cacgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc tgcacagggc 660
gtcggcgtac agttgacgcg caacggtacg attattccag cgaataacac ggtatcgtta 720
ggagcagtag ggacttcggc ggtgagtctg ggattaacgg caaattatgc acgtaccgga 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 18
<211> 837
<212> DNA
<213> E. coli

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caaatctttt gccataacga ttacccggaa accattacag actatgtcac actgcaacga 180
ggttcggctt atggcggcgt gttatctagt ttttccggga ccgtaaaata taatggcagt 240
agctatcctt tccctactac cagcgaaacg ccgcgggttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg cctgtgagca gtgcgggggg agtggcgatt 360
aaagctggct cattaattgc cgtgcttatt ttgcgacaga ccaacaacta taacagcgat 420

gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtggtgcc cactggcggc 480
tgcgatgttt ctgctcgtga tgtcaccgtt actctgccgg actaccctgg ttcagtgccg 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct ctccggcaca 600
accgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc cgcgcagggc 660
gtcggcgtac agttggcgcg caacggtacg gttattccag cgaataacac ggtatcgtta 720
ggagcagtag ggacttcggc ggtaagtctg ggattaacgg caaattacgc acgtaccgga 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 19
<211> 837
<212> DNA
<213> E. coli

<400> 19
ttcgcctgta aaaccgccaa tggtaccgca atccctattg gcggtggcag cgccaatgtt 60
tatgtaaacc ttgcgcctgc cgtgaatgtg gggcaaaacc tggtcgtaga tctttcgacg 120
caaatctttt gccataacga ttacccagaa accattacag actatgtcac actgcaacga 180
ggttcggctt atggcggcgt gttatctagt ttttccggga ccgtaaaata taatggcagt 240
agctatcctt tccctactac cagcgaaacg ccgcgggttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg ctggtgagca gtgcgggggg agtggcgatt 360
aaagctggct cattaattgc cgtgcttatt ttgcgacaga ccaacaacta taacagcgat 420
gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtggtgcc cactggcggc 480
tgtgatgttt ctgctcgtga tgtcaccgtt actctgccgg actaccctgg ttcagtgccg 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct atccggcaca 600
accgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc cgcgcagggc 660
gtcggcgtac agttgacgcg caacggtacg attattccag cgaataacac ggtatcgtta 720
ggagcagtag ggacttcggc ggtaagtctg ggattaacgg caaattacgc acgtaccgga 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 20
<211> 837
<212> DNA
<213> E. coli

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caaatctttt gccataacga ttatccggaa accattacag actatgtcac actgcaacga 180
ggctcggctt atggcggcgt gttatctaat ttttccggga ccgtaaaata tagtggcagt 240
agctatccat ttccgaccac cagcgaaacg ccgcgggttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg cctgtgagca gtgcgggcgg ggtggcgatt 360
aaagctggct cattaattgc cgtgcttatt ttgcgacaga ccaaaaacta taacagcgat 420
gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtagtgcc tactggcggc 480
tgcgatgttt ctgctcgtga tgtcaccgtt actctgccgg actaccctgg ttcagtgcca 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct ctccggcaca 600
accgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc agcgcagggc 660
gtcggcgtac agttgacgcg caacggtacg attattccag cgaataacac ggtatcgtta 720
ggaacagtag gaacttcggc ggtaagtctg ggattaacgg caaattacgc acgtaccggc 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 21
<211> 837
<212> DNA
<213> E. coli

<400> 21
ttcgcctgta aaaccgccaa tggtaccgct atccctattg gcggtggcag cgccaatgtt 60
tatgtaaacc ttgcgcccgt cgtgaatgtg gggcaaaacc tggtcgtgga tctttcgacg 120
caaatctttt gccataacga ttatccggaa accattacag actatgtcac actgcaacga 180
ggctcggctt atggcggcgt gttatctaat ttttccggga ccgtaaaata tagtggcagt 240
agctatccat ttcctaccac cagcgaaacg ccgcgcgttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg cctgtgagca gtgcgggcgg ggtggcgatt 360
aaagctggct cattaattgc cgtgcttatt ttgcgacaga ccaacaacta taacagcgat 420
gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtggtgcc tactggcggc 480
tgcgatgttt ctgctcgtga tgtcaccgtt actctgccgg actaccctgg ttcagtgcca 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct ctccggcaca 600
accgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc tgcacagggc 660
gtcggcgtac agttgacgcg caacggtacg attattccag cgaataacac ggtatcgtta 720
ggagcagtag ggacttcggc ggtgagtctg ggattaacgg caaattatgc acgtaccgga 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 22
<211> 837
<212> DNA
<213> E. coli

<400> 22
ttcgcctgta aaaccgccaa tggtaccgca atccctattg gcggtggcag cgccaatgtt 60
tatgtaaacc ttgcgcctgc cgtgaatgtg gggcaaaacc tggtcgtaga tctttcgacg 120
caaatctttt gccataacga ttacccagaa accattacag actatgtcac actgcaacga 180
ggtgcggctt atggcggcgt gttatctagt ttttccggga ccgtaaaata taatggcagt 240
agctatcctt tccctactac cagcgaaacg ccgcgggttg tttataattc gagaacggat 300
aagccgtggc cggtggcgct ttatttgacg ccggtgagca gtgcgggggg agtggcgatt 360
aaagctggct cattaattgc cgtgcttatt ttgcgacaga ccaacaacta taacagcgat 420
gatttccagt ttgtgtggaa tatttacgcc aataatgatg tggtggtgcc cactggcggc 480
tgcgatgttt ctgctcgtga tgtcaccgtt actctgccgg actaccctgg ttcagtgccg 540
attcctctta ccgtttattg tgcgaaaagc caaaacctgg ggtattacct ctccggcaca 600
accgcagatg cgggcaactc gattttcacc aataccgcgt cgttttcacc cgcgcagggc 660
gtcggcgtac agttgacgcg caacggtacg attattccag cgaataacac ggtatcgtta 720
ggagcagtag ggacttcggc ggtaagtctg ggattaacgg caaattacgc acgtaccgga 780
gggcaggtga ctgcagggaa tgtgcaatcg attattggcg tgacttttgt ttatcaa 837

<210> 23
<211> 279
<212> PRT
<213> E. coli

<400> 23
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Ile Val Lys Tyr Ser Gly Ser

65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Ala Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Ala Arg Asn Gly Thr Val Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 24
<211> 279
<212> PRT
<213> E. coli

<400> 24
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Ser Phe Ser Gly Ile Val Lys Tyr Asn Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Ala Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 25
<211> 279
<212> PRT
<213> E. coli

<400> 25
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ala Ala Tyr
    50   55   60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65   70   75   80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85   90   95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100   105   110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115   120   125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130   135   140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145   150   155   160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165   170   175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180   185   190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195   200   205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210   215   220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225   230   235   240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245   250   255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260   265   270

Gly Val Thr Phe Val Tyr Gln
        275

<210> 26
<211> 279
<212> PRT
<213> E. coli

<400> 26
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1   5   10   15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
            20   25   30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr

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        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ala Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln
        275

<210>  27
<211>  279
<212>  PRT
<213>  E. coli

<400>  27
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1               5                   10                  15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
            20                  25                  30
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Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Val Ser Ala His Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln
        275

<210>  28
<211>  279
<212>  PRT
<213>  E. coli

<400>  28
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1               5                   10                  15
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Ser Ala Asn Val Tyr Val Asn Leu Ala Ile Ala Val Asn Val Gly Gln
            20                  25                  30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Val Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Ala Thr Phe Val Tyr Gln
        275

<210>  29
<211>  279
<212>  PRT
<213>  E. coli

<400>  29
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
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1               5                  10                  15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val Val Asn Val Gly Gln
            20                  25                  30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Leu Val Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Thr Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln
        275
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<210> 30
<211> 280
<212> PRT
<213> E. coli

<400> 30

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Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1               5                  10                  15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
            20                  25                  30

Asn Leu Val Val Asp Leu Ser Thr Gln Thr Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Val Ser Ala His Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln Glx
        275                 280
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<210> 31
<211> 279

<212> PRT
<213> E. coli

<400> 31

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Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1               5                  10                  15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
            20                  25                  30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Ala Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln
        275
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<210> 32
<211> 279
<212> PRT
<213> E. coli

<400> 32
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Val Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Pro
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr Thr Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln

275

<210> 33
<211> 279
<212> PRT
<213> E. coli

<400> 33
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1   5   10   15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
            20   25   30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35   40   45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ala Ala Tyr
    50   55   60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65   70   75   80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85   90   95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100   105   110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115   120   125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130   135   140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145   150   155   160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Pro
                165   170   175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180   185   190

Leu Gly Tyr Tyr Leu Ser Gly Thr Thr Ala Asp Ala Gly Asn Ser Ile
        195   200   205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210   215   220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225   230   235   240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245   250   255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260   265   270

Gly Val Thr Phe Val Tyr Gln
275

<210> 34
<211> 279
<212> PRT
<213> E. coli

<400> 34
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Pro
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr Thr Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 35
<211> 279
<212> PRT
<213> E. coli

<400> 35
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Ser Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr

245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 36
<211> 279
<212> PRT
<213> E. coli

<400> 36
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Val Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Arg Ser Ile Ile
260 265 270

Ala Val Thr Phe Val Tyr Gln
275

<210> 37
<211> 279
<212> PRT
<213> E. coli

<400> 37
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Glu Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 38
<211> 279
<212> PRT
<213> E. coli

<400> 38
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser His Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Met Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln

210 215 220

Leu Thr Arg Asn Gly Thr Ile Asn Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 39
<211> 279
<212> PRT
<213> E. coli

<400> 39
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Val Arg Asp Val Thr Val Ile Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Lys Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 40
<211> 279
<212> PRT
<213> E. coli

<400> 40
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Ala Asn Gly Thr Ile Val Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 41
<211> 279
<212> PRT
<213> E. coli

<400> 41
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Leu Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn

```
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln
        275
```

<210> 42
<211> 279
<212> PRT
<213> E. coli

<400> 42

```
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1               5                   10                  15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val Val Asn Val Gly Gln
            20                  25                  30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
                165                 170                 175
```

```
Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
            180                 185                 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
        195                 200                 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
    210                 215                 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225                 230                 235                 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
                245                 250                 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
            260                 265                 270

Gly Val Thr Phe Val Tyr Gln
        275
```

<210> 43
<211> 279
<212> PRT
<213> E. coli

<400> 43

```
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1               5                   10                  15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
            20                  25                  30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
        35                  40                  45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
    50                  55                  60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65                  70                  75                  80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
                85                  90                  95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
            100                 105                 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
        115                 120                 125

Leu Ile Leu Arg Gln Thr Lys Asn Tyr Asn Ser Asp Asp Phe Gln Phe
    130                 135                 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145                 150                 155                 160
```

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Thr Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 44
<211> 279
<212> PRT
<213> E. coli

<400> 44
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly

145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Pro
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr Thr Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 45
<211> 279
<212> PRT
<213> E. coli

<400> 45
Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile Pro Ile Gly Gly Gly
1 5 10 15

Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Ala Val Asn Val Gly Gln
20 25 30

Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ala Ala Tyr
50 55 60

Gly Gly Val Leu Ser Ser Phe Ser Gly Thr Val Lys Tyr Asn Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
245 250 255

Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn Val Gln Ser Ile Ile
260 265 270

Gly Val Thr Phe Val Tyr Gln
275

<210> 46
<211> 7416
<212> DNA
<213> Artificial

<220>
<223> Sequence of Plasmid pCGA126-1

<400> 46
gcgcccaata cgcaaaccgc ctctccccgc gcgttggccg attcattaat gcagctggca 60
cgacaggttt cccgactgga aagcgggcag tgagcgcaac gcaattaatg tgagttagct 120
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tgtgagcgga taacaatttc acacaggaaa cagctatgag taataaaaac gtcaatgtaa 240
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<211> 726
<212> DNA
<213> Artificial

<220>
<223> Sequence of J96 fimC plus native signal sequence

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aatgatgaaa atagtaccta tttaattcaa tcatgggtgg aaaatgccga tggtgtaaag 240
gatggtcgtt ttatcgtgac gcctcctctg tttgcgatga agggaaaaaa agagaatacc 300
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ctcgcaatta tcagccgcat taaactgtac tatcgcccgg ctaaattagc gttgccaccc 480
gatcaggccg cagaaaaatt aagatttcgt cgtagcgcga attctctgac gctgattaac 540
ccgacaccct attacctgac ggtaacagag ttgaatgccg gaacccgggt tcttgaaaat 600
gcattggtgc ctccaatggg cgaaagcacg gttaaattgc cttctgatgc aggaagcaat 660
attacttacc gaacaataaa tgattatggc gcacttaccc ccaaaatgac gggcgtaatg 720
gaataa 726

<210> 48
<211> 903
<212> DNA
<213> Artificial

<220>
<223> Sequence J96 fimH plus native signal sequence

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gtttatgtaa accttgcgcc cgtcgtgaat gtggggcaaa acctggtcgt ggatctttcg 180
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acaaccgcag atgcgggcaa ctcgattttc accaataccg cgtcgttttc acctgcacag 720
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taa 903

<210> 49
<211> 814
<212> DNA
<213> Artificial

<220>
<223> Sequence of kanamycin R gene

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taataacctt atttttgacg aggggaaatt aataggttgt attgatgttg gacgagtcgg 660
aatcgcagac cgataccagg atcttgccat cctatggaac tgcctcggtg agttttctcc 720
ttcattacag aaacggcttt ttcaaaaata tggtattgat aatcctgata tgaataaatt 780
gcagtttcat ttgatgctcg atgagttttt ctaa 814

<210> 50
<211> 1085
<212> DNA
<213> Artificial

<220>
<223> Sequence of Lac IQ

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cggcgatggc ggagctgaat tacattccca accgcgtggc acaacaactg gcgggcaaac 180
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agtga 1085

<210> 51
<211> 862
<212> DNA
<213> Sequence of beta-lacyamase gene

<400> 51
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cgagtgggtt acatcgaact ggatctcaac agcggtaaga tccttgagag ttttcgcccc 180
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cggaggaccg aaggagctaa ccgcttttt gcacaacatg ggggatcatg taactcgcct 480
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ctcactgatt aagcattggt aa 862

<210> 52
<211> 601
<212> DNA
<213> Artificial

<220>
<223> Sequence of the origin of replication

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<210> 53
<211> 116
<212> DNA
<213> Sequence of Lac p/o

<400> 53
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ggctcgtatg ttgtgtggaa ttgtgagcgg ataacaattt cacacaggaa acagct 116

<210> 54
<211> 837
<212> DNA
<213> E. coli

<400> 54
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Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe Cys His Asn Asp Tyr
35 40 45

Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln Arg Gly Ser Ala Tyr
50 55 60

Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val Lys Tyr Ser Gly Ser
65 70 75 80

Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro Arg Val Val Tyr Asn
85 90 95

Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu Tyr Leu Thr Pro Val
100 105 110

Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly Ser Leu Ile Ala Val
115 120 125

Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser Asp Asp Phe Gln Phe
130 135 140

Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val Val Pro Thr Gly Gly
145 150 155 160

Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr Leu Pro Asp Tyr Arg
165 170 175

Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys Ala Lys Ser Gln Asn
180 185 190

Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp Ala Gly Asn Ser Ile
195 200 205

Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln Gly Val Gly Val Gln
210 215 220

Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn Asn Thr Val Ser Leu
225 230 235 240

Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly Leu Thr Ala Asn Tyr
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Gly Val Thr Phe Val Tyr Gln
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